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EXAMINER	
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ART UNIT	PAPER NUMBER
2834	

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Please find below and/or attached an Office communication concerning this application or proceeding.

H·A

Office Action Summary	Application No.	Applicant(s)
	09/584,881	HAGOOD ET AL.
	Examiner	Art Unit
	Thomas M. Dougherty	2834

-- The MAILING DATE of this communication appears on the cov r sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 29 November 2004.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 54-56 and 58-93 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 54,58-63,66,67 and 70-93 is/are rejected.

7)☒ Claim(s) 55,56,64,65,68 and 69 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 07 December 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 54, 58-63, 66, 67, 70, 81-84, and 89-93 are rejected under 35 U.S.C. 103(a) over Crawley (US 4,849,668) in view of Atsuta (US 6,072,267). Crawley et al. show (fig. 2) a method for at least partially suppressing a vibration of a mechanical disturbance, comprising: measuring a characteristic of the disturbance using a sensor (10 and 112), and based on the measured characteristic, actuating at an electrical circuit (202) to cause an electromechanical transducer (104, 106) coupled to the disturbance to act on the disturbance to at least partially suppress the vibration.

The measured characteristic is selected from the group consisting of: vibration amplitude (generated by 10), vibration frequency, vibration mode, physical strain, position, displacement, pressure, voltage, current temperature humidity, altitude, force, orientation, acceleration, motion, a physically measurable quantity corresponding to a mechanical or electrical property, a rate of change of a subset thereof, and a combination thereof.

The sensor is selected from the group consisting of: strain gauge (col. 4, l. 63), pressure sensor, PVDF film, accelerometer, active fiber composite sensor, composite sensor, and a combination thereof.

Crawley doesn't show any outside power means: no battery, no solar panels, no input from a power supply, thus his invention suggests to inclusion of using the transducer to convert at least a portion of mechanical energy of the disturbance to electrical energy, and applying at least a portion of the electrical energy to the transducer.

The method including using the transducer to convert at least a portion of mechanical energy of the disturbance to electrical, and applying at least a portion of the electrical energy to the electrical circuit (12).

Crawley doesn't show any outside power means: no battery, no solar panels, no input from a power supply, thus his invention suggests using the transducer to convert at least a portion of mechanical energy of the disturbance to electrical energy, and applying at least a portion of the electrical energy (output from 10) to the sensor (8).

As shown in the figure all electrical energy supplied to at least one of the transducer, the electrical circuit, and the sensor is derived solely form a subset of energy extracted for the mechanical disturbance.

Crawley et al. show (fig. 2) a system for at least partially suppressing a vibration of a mechanical disturbance, comprising: an electromechanical transducer (14) coupled to the disturbance and configured for exchanging mechanical energy with the disturbance; a sensor (10) for measuring a characteristic of the disturbance: and an

electrical circuit (12) in communication with the sensor (10) and coupled to the transducer (14) for causing the transducer (14) to act on the disturbance to at least partially suppress the vibration, based on the measured characteristic.

The transducer (14) is selected from the group consisting of; piezoelectric transducer (14, noted as embedded piezoelectric elements), antiferroelectric transducer, electrostrictive transducer, piezomagnetic transducer, magnetostrictive transducer, jagnetic shape memory transducer, and a combination thereof.

The sensor is selected from the group consisting of: strain gauge, pressure sensor, PVDF film, accelerometer, composite sensor, and a combination thereof. Note that at least strain gauge, pressure sensor, PVDF film, composite sensor are applicable here.

As shown in the figure all electrical energy supplied to at least one of the transducer, the electrical circuit, and the sensor is derived solely form a subset of energy extracted for the mechanical disturbance.

As noted above, Crawley et al. show (fig. 2) a system for at least partially suppressing a vibration of a mechanical disturbance, comprising: an electromechanical transducer (10) coupled to the disturbance and configured for converting at least a portion of mechanical energy associated with the disturbance to electrical energy (note output of 10 to sensor/analyzer 8); an electrical circuit (8, 12) coupled to the transducer (10) to process at least a portion of the electrical energy; dissipating at least a portion of the processed electrical energy, thereby at least partially suppressing a vibration of the disturbance by reducing the mechanical energy associated with the disturbance.

As noted above, Crawley doesn't show any outside power means: no battery, no solar panels, no input from a power supply, thus his invention suggests using the transducer to convert all electrical energy supplied to at least one of the transducer; the electrical circuit and the sensor is derived at least in part from a subset of energy extracted from the mechanical disturbance.

As noted above, all electrical energy supplied to at least one of the transducer, the electrical circuit, and the sensor is derived solely from a subset of energy extracted from the mechanical disturbance.

The measured characteristic is selected from the group consisting of: vibration amplitude, vibration frequency, vibration mode, physical strain, position, displacement, pressure, voltage, current, temperature, humidity, altitude, force, orientation, acceleration, motion, a physically measurable quantity corresponding to a mechanical or electrical property, a combination thereof, and a rate of change of the combination thereof. Note that the embedded piezoelectric elements act as strain gauges, ergo, they clearly provide information on a physically measurable quantity corresponding to a mechanical or electrical property. See col. 2, ll. 49-56.

Crawley et al. do not show specific switching means.

Atsuta shows (fig. 2) a method for driving a piezoelectric vibrator comprising: actuating at least one active switch (4 or 6) of an electrical circuit to cause an electromechanical transducer to vibrate.

He shows the electrical circuit including a control circuit(11) for controlling the amplifier circuit (4, 5).

Atsutas at least one of the at least one active switch is selected from the group consisting of: MOSFET, bipolar transistor, AGBT, SCR, and a combination thereof. Not that he shows bipolar junction transistors in his switches (4, 5).

Atsuta does not show a method for at driving a piezoelectric vibrator suppressing a vibration of a mechanical disturbance comprising: measuring a characteristic of the disturbance using a sensor, and based on the measured characteristic, actuating at an electrical circuit to cause an electromechanical transducer coupled to the disturbance to act on the disturbance to at least partially suppress the vibration.

It would have been obvious to one having ordinary skill in the art to employ an active switch in the device of Crawley et al., such as is shown by Atsuta, because this is a simplified driving circuit as Atsuta notes at col. 2, ll. 27-30.

Claims, 70-76 are rejected under 35 U.S.C. 103(a) over Crawley (US 4,849,668) in view of a Puskas (US 4,743,789). Crawley et al. show (fig. 2) a method for at least partially suppressing a vibration of a mechanical disturbance, comprising: measuring a characteristic of the disturbance using a sensor (10 and 112), and based on the measured characteristic, actuating at an electrical circuit (202) to cause an electromechanical transducer (104, 106) coupled to the disturbance to act on the disturbance to at least partially suppress the vibration.

Crawley et al. do not show specific switching means.

Puskas shows (fig. 9) a method for driving a piezoelectric vibrator comprising: actuating at least one active switch (18 or 20) of an electrical circuit to cause an electromechanical transducer to vibrate.

Puskas at least one of the at least one active switch is selected from the group consisting of: MOSFET, bipolar transistor, AGBT, SCR, and a combination thereof. Not that he shows MOSFETS in his switches.

Note that a MOSFET is a switching amplifier.

Puskas's control circuit controls the amplifier circuit.

Puskas also shows at least one of the at least one active switch includes a diode. (e.g. 28a).

Puskas' electrical circuit includes a resonant circuit to at least approximately match a characteristic of the vibration. See his ABSTRACT.

The resonant circuit (14, 16) is coupled to the transducer (12) to at least approximately match a behavior of the transducer (12). See discussion at column 4, lines 61-68.

The resonant circuit includes at least one inductor (14, 16).

Puskas' electrical circuit includes a control circuit (22) for controlling at least one of the at least one active switch (18, 20).

The resonant circuit includes at least on capacitor (12). See discussion at column 4, lines 61-68.

Puskas does not show a method for at driving a piezoelectric vibrator suppressing a vibration of a mechanical disturbance comprising: measuring a characteristic of the disturbance using a sensor, and based on the measured characteristic, actuating at an electrical circuit to cause an electromechanical transducer

coupled to the disturbance to act on the disturbance to at least partially suppress the vibration.

It would have been obvious to one having ordinary skill in the art to employ an active switch in the device of Crawley et al., such as is shown by Atsuta, because this is a simplified driving circuit as Atsuta notes at col. 2, ll. 27-30.

Claims, 77 and 85 are rejected under 35 U.S.C. 103(a) over Crawley (US 4,849,668) and Puskas (US 4,743,789) in view of Futami et al. (US 5,079,493). Given the combined invention of Crawley and Puskas as noted above, it is non known what method is employed by the controller.

Futami et al. note a controlling that employs a method selected from the group consisting of: rate feedback, positive position feedback, **position-integral-derivative feedback (PID)**, linear quadratic Gaussian (LQG) control, model-based control, a dynamic compensator-based control, and a combination thereof in their piezoelectric driving system.

Futami et al. Do not show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ the PID system in the controller in the combined device of Crawley and Puskas at the time of their invention because the PID controller is able to take inputs concerning desired action and actual action, therefore use of such would allow fine driving adjustments. See the discussion of figure 15, at col. 8, ll. 40-57.

Claims, 78-80 and 86 are rejected under 35 U.S.C. 103(a) over by Crawley (US 4,849,668) and Puskas (US 4,743,789) in view of Gipson et al. (US 5,900,690). Given the combined invention of Crawley and Puskas as noted above, Crawley notes that resonant modes are sensed, therefore the frequency of vibration is indicative of the disturbance.

In the combined invention no discussion of duty cycle adjustment is made.

Gipson et al. note in their transducer control circuit that controlling includes adjusting a duty cycle of the drive signal thereby adjusting the energy level of the drive signal.

Note that phase detection and comparison also occurs. See the ABSTRACT.

Gipson et al. do not show a system for at least partially suppressing a vibration of mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ a means to adjust the duty cycle of the drive signal in the combined device of Crawley and Puskas, at the time of their invention, in order to precisely control the energy supplied and to change that energy value if desired, such as is taught by Gipson et al. at col. 4, ll. 37-46.

Claims 87 and 88 are rejected under 35 U.S.C. 103(a) over Crawley et al. (US 4,849,668) and Puskas (US 4,743,789) in view of Reid (US 5,033,496). Given the combined invention of Crawley and Puskas as noted above, it is unknown whether or not Crawley et al. include a rectifier in their circuit.

Reid shows (fig. 1) an electrical circuit including a rectifier circuit (40) wherein the rectifier circuit (40) is coupled to a transducer (44).

Reid does not show a system for at least partially suppressing a vibraton of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ the rectifier circuit of Reid in the combined device of Crawley and Puskas because this allows for a DC voltage to be applied thereby allowing manipulation of pulses to the piezoelectric transducer, as Reid shows.

Allowable Subject Matter

Claims 55, 56, 64, 65, 68, 69 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art does not show that the transducer approximately matches a phase or motion of the disturbance to at least partially suppress vibration, although for the combined device to be effective. Such a design is counterintuitive since typically, to eliminate vibration the disturbance and the signal to dampen the disturbance are 180^0 out of phase. Additionally, the prior art does not suggest use of transducer coupling to a disturbance by a mechanical or hydraulic amplifier in a structure that employs output from a sensor to supply signals to a control logic which outputs signals to the transducer to limit the disturbance.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The remaining prior art cited reads on some aspects of the claimed invention particularly active switches employed in electrical circuits for causing piezoelectric elements to vibrate.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Direct inquiry concerning this action to Examiner Dougherty at (571) 272-2022.

tmd
tmd

January 28, 2005

Thomas M. Dougherty
TOM DOUGHERTY
PRIMARY EXAMINER